IRIG STANDARD 167-95

DATA REDUCTION AND COMPUTER GROUP

IRIG STANDARD FORMAT FOR INTERRANGE EXCHANGE OF POST-MISSION TIME-SPACE-POSITION INFORMATION

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IRIG STANDARD 167-95

IRIG STANDARD FORMAT FOR INTERRANGE EXCHANGE OF POST-MISSION TIME-SPACE POSITION INFORMATION

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PREFACE

This standard was written to satisfy RCC Data Reduction and Computer Group task DR-18, Standard Format for Interrange Exchange of Post-Mission Time-Space-Position Information (TSPI). It describes a minimal data set which will provide any range user with everything necessary to use TSPI in analysis software to produce the needed reports. Because many customer representatives do not have enough information to know what data set should be specified to do the job, a standard providing the information to do every task is desirable. While this standard does not provide a basis for every conceivable task, it does provide a basis for all trajectory parameters commonly used in analyzing target performance. Because range users often request reports from different ranges to meet immediate needs, the required information often expands in scope as specific software developments are made to support engineering analysis. When parameter requirements are expanded as data is being analyzed, the only method of obtaining the required TSPI parameters is to retrieve the original tracking media. Original tracking media is not necessarily archived forever. Each range will retain the original data according to its own archiving practice once the customer has the data.

This standard should be presented to the range customer whenever any TSPI data is requested. Range customers usually require reports from a set of customer-selected parameters in the range's standard format. Custom-made media are certainly in order for many range data applications. It is necessary for the customer to define requirements from the beginning, because if at a later time the customer needs different data, this set of parameters will not contain the essential TSPI to complete the task the TSPI was generated for in the first place. As a result, analysis activity is then severely hampered by working around the lack of appropriate information. Although the format offered is not necessarily meaningful in every situation, it is a vehicle to aid in clarifying the essential elements of the standard. Important elements are the information included and the fact that the data transmitted is of value only if the recipient can use it.

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1. INTRODUCTION

Time-space-position information (TSPI) can only be produced at a small number of locations, most of which are represented in the Range Commanders Council (RCC). Each of these locations or ranges has a wide variety of customers including the Department of Defense (DOD), National Aeronautics and Space Administration (NASA), industry, and foreign countries. The RCC ranges are frequently reciprocal users of each other's facilities. As an illustration, the Navy and Air Force cruise missiles fly over the far western ranges starting somewhere over the Pacific Ocean and terminating at various inland ranges. The space shuttle has overflown every range in the world and has a requirement to consolidate TSPI data into a single form. In a similar manner, test programs often go to White Sands Missile Range to perform air-to-air tests, and some test programs from Edwards Air Force Base find appropriate range attributes at the Naval Air Warfare Center Weapons Division, China Lake. It is not known what happens in every case, but there are many cases where the program coordinators, who negotiate for TSPI data, do not quite match the later needs for data reduction and analysis. It is easy to find programs where the exchange tape was different in parameter order and frequently in actual parameters contained. From time to time, the parameters required to do the analysis do not appear on a new tape, even though they were there on the first five. When the change is tracked to its source, the TSPI provided is what was requested. It is very difficult to track down what has, or is, happening. If this standard is used (superimposed over any request for TSPI) it will not matter if the program manager requesting TSPI has a changing requirement for printed TSPI reports, because the basic standard TSPI will also always be on the magnetic media.

2. APPLICATIONS

All data should be recorded in a format appropriate for exchange such as the eight-bit ASCII format. The example in this standard might be used for a nine-track magnetic tape, although other means of exchange can be used. The exchange example assumes a text file is used such as ASCII, because in many cases nothing more than a formatted read is necessary to decode the data for computer use. The data format as it appears on the tape, disk, or net is not the most important feature of this standard. The most important feature is the information being exchanged on the media.

3. PARAMETERS

The parameters exchanged are a minimal set to compute all necessary trajectory-related information available from range instrumentation. The parameters used in this exchange are an Earth-axes system which originates at the Earth's center. Commonly known as the EFG-coordinate system, these parameters are time, E, F, and G axes.

Time is defined as the time of day, local or universal time code, or elapsed time recorded in the collection of the TSPI data.

E-axis is positive in the direction of the zero meridian lying in the equatorial plane.

F-axis is positive 90° east to the E-axis lying in the equatorial plane.

G-axis is positive along the axis of rotation in the direction of the North Pole.

With time and a knowledge of the Earth reference model, it is possible to compute geodetic coordinates and parameters related to the Earth's surface or the vehicle's center of gravity. A complete specification of the EFG coordinate system is provided in RCC Document 151-85, Global Coordinate System.

4. FORMAT

The TSPI-file format includes several types of data records. There is general header information, so data can be properly identified from the media itself. There is important information about the data on the media regarding the Earth model used, the type and number of sensors used, level of editing taken place, and any special considerations useful to the tester. At times, one continuous time slice may not be appropriate. As a result, it is possible to make multiple separate data files based on time to be placed on a single media. Each of these data sections has a header record which applies a name to the data values which follow. It is also possible to place information in the header records to provide unique identifiers or information pertinent to any pass. The data records are fixed in form and will never have all records equal to zero. Although time can be zero, it is impossible for E, F, and G to be zero. A record of all ASCII zeros is used to identify the end of a pass. Similarly, a pass header record with all ASCII blanks will be used to identify the end of information on the media and will make it possible to control the end of media activities without depending on the compatibility of computer-generated end-of-file markers.

4.1 TSPI FILE FORMATS

In the first part of this section, several types of records are referenced. Each of these records is given a name and its contents described. Data words are described in several ways including the use of standard FORTRAN symbols.

4.1.1 TSPI-File Header

FIELD	NAME	DESCRIPTION	UNITS	FORMAT
1	VID	Vehicle ID	none	A10
2	OPNO	Operation number	none	A10
3	TESTDT	Test date (Format "DDMMYY")	none	A6
4	FILEDT	Date TSPI file written (Format "HHMMSS")	none	A6
5	FILETM	Time TSPI file written Format "HHMMSS")	hours minutes seconds	A10
6	TIMEBAS	Nomenclature for the time format in use	none	A20
7	EARMOD	Earth model	none	A10
8	RANGE	Test range	none	A10
9	CONTACT	Point of contact	none	A20
10	COMNO	Number of comments	integer	I2
11	COMMENT	Number of comments is COMNO	none	A80

4.1.2 TSPI File Data Sections. A TSPI File Data Section is made up of two record types. The first is a Section Header Record which contains particular details about the data contained in the TSPI File Section. This section allows for a vehicle identification, since it is possible to combine the data from a multiple vehicle track. Vehicle identifications (VID) have a special field which can be left blank or can duplicate the header field VID when only one vehicle track is included on the file. The VID in the TSPI File-Header Record is the primary vehicle being tracked and, in the event of multiple vehicle tracking, its ID will also need to appear in those TSPI File Data Section headers which contain its data.

For this special standard, a count of three is used to count the number of parameters in addition to time which are in the file, and in this case only three parameters - E, F, and G - are in the file. A special form of this record is used to end the file. End of file, in this case, is a reference to the end of all data or the end of information. The last record in a TSPI File Data Section will contain all ASCII zeroes.

4.1.2.1 Section Header.

FIELD	NAME	DESCRIPTION	UNITS	FORMAT
1	SECNO	Data section	integer	I3
2	VID_S	Vehicle ID Section	none	A10
3	ST	Sensor type	none	A10
4	SID	Sensor ID	none	A10
5	COM	Data section comments	none	A20
6	NP	Number of parameters	integer	I4
7 to (NP+6)	PARNAME	Parameter names Limit 9,999	none	A10

In this application for this standard, the following values are fixed for all application:

PARNAME(1) = TIME
PARNAME(2) = Ebbbbbbbbb
PARNAME(3) = Fbbbbbbbbb
PARNAME(4) = Gbbbbbbbbb

Parameter names beyond PARNAME(4), that is, parameter names PARNAME(5) through PARNAME(NP) can be any names agreed to by the range providing the TSPI data and the customer receiving the data. The upper limit is NP = 9999.

4.1.2.2 Data Records

FIELD	NAME	DESCRIPTION	UNITS	FORMAT
1	TIME	bb0	integer	I3
2	E	all blank	none	A10
3	F	all blank	none	A10
4	G	all blank	none	A20
5 to NP		bbb0	integer	I4

All legitimate data records will have nonzero values for at least one of the values E, F, or G, and, as a practical matter, none will ever be zero. Generally, time will not be zero. To indicate that the end of data in a particular section has been reached, a record with all zeroes will be written. This last record will be identified as the ZERO RECORD in what follows.

4.1.2.3 Final Record. The final data record in this standard file will be the Section Header record containing zeroes and blanks depending on its type.

FIELD	NAME	DESCRIPTION	UNITS	FORMAT
1	SECNO	BB0	integer	I3
2	ST	all blank	none	A10
3	SID	all blank	none	A10
4	COM	all blank	none	A20
5	NP	bbb0	integer	I4

4.2 TSPI File Format

This part contains a display of how the typical TSPI file will appear:

TSPI FILE HEADER
SECTION HEADER - Sec # 1
DATA RECORD - 1
.
.
DATA RECORD - M1
ZERO RECORD
SECTION HEADER - # 2
DATA RECORD - 1
.
.
DATA RECORD - M2
ZERO RECORD
.
.
SECTION HEADER - Sec # N
DATA RECORD - N
.
.
DATA RECORD - MN
ZERO RECORD
FINAL RECORD

This paragraph taken with the remainder of paragraph 4 is sufficient to produce a TSPI file which complies with the standard.